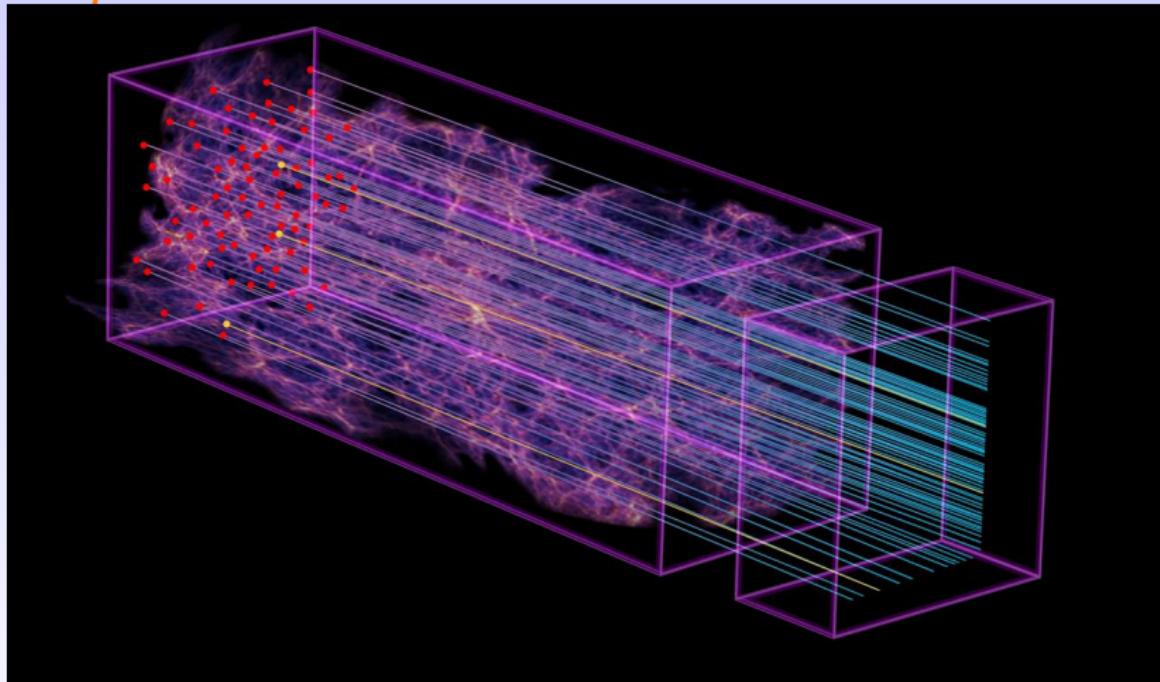


Update on the Lyman- α mock making

Anže Slosar, Brookhaven National Laboratory

BNL group meeting, 12/16

Recap

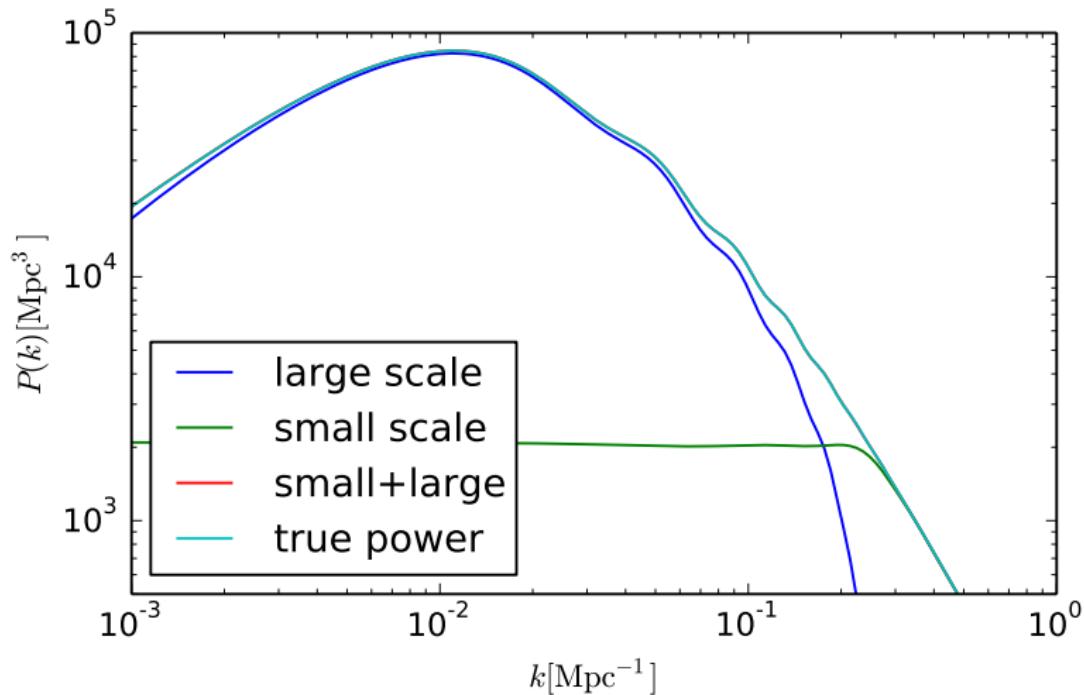


- ▶ The problem: create a field that contains correct correlations on scales from 10kpc to 10Gpc
- ▶ Difficulty: impossible to do 100000^3 FFT.

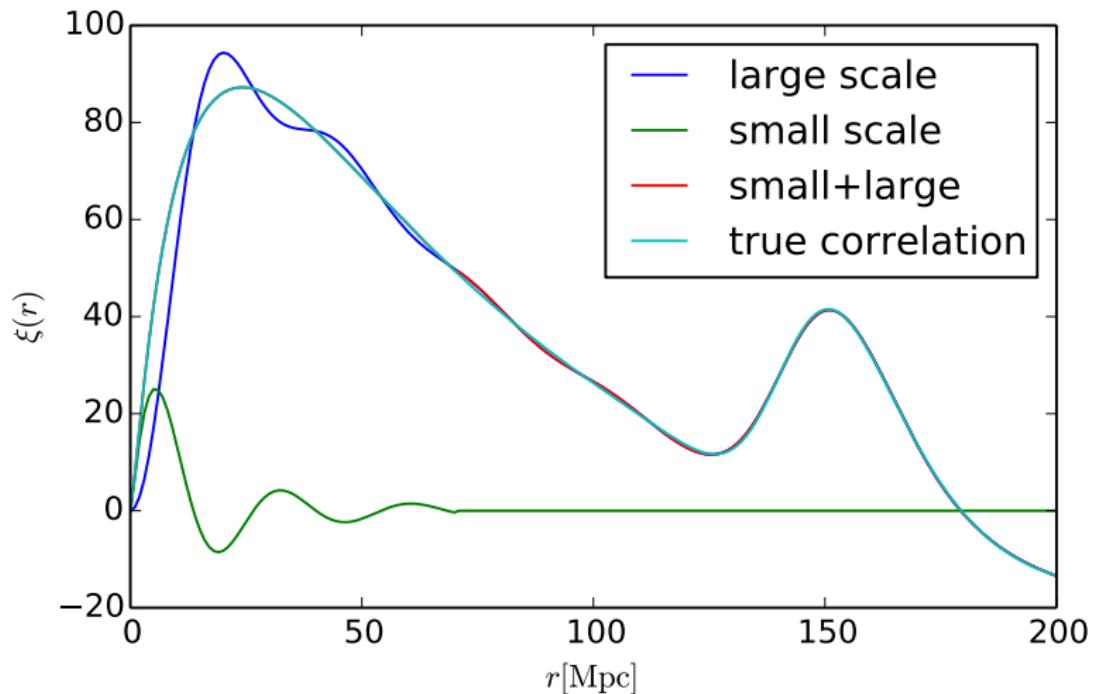
The solution

- ▶ Split the creation into two:
 - ▶ Large scales using brute force FFT
 - ▶ Small scales using Cholesky decomposition relying on correlations vanishing beyond certain r .

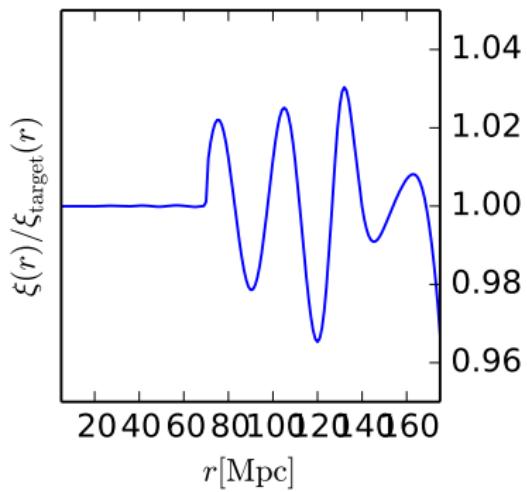
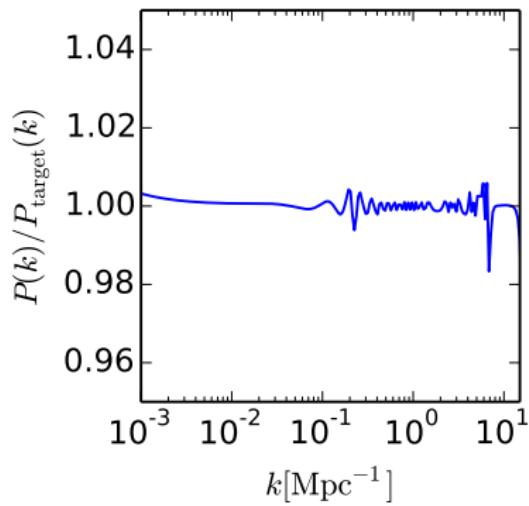
Split



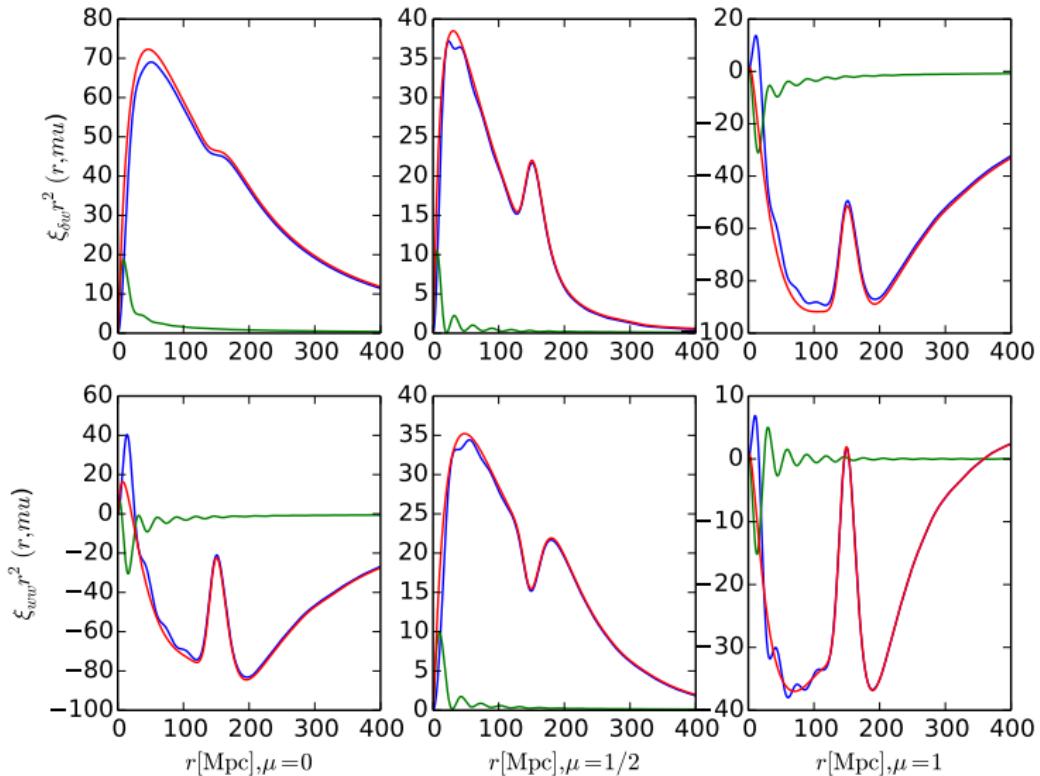
Split



Split



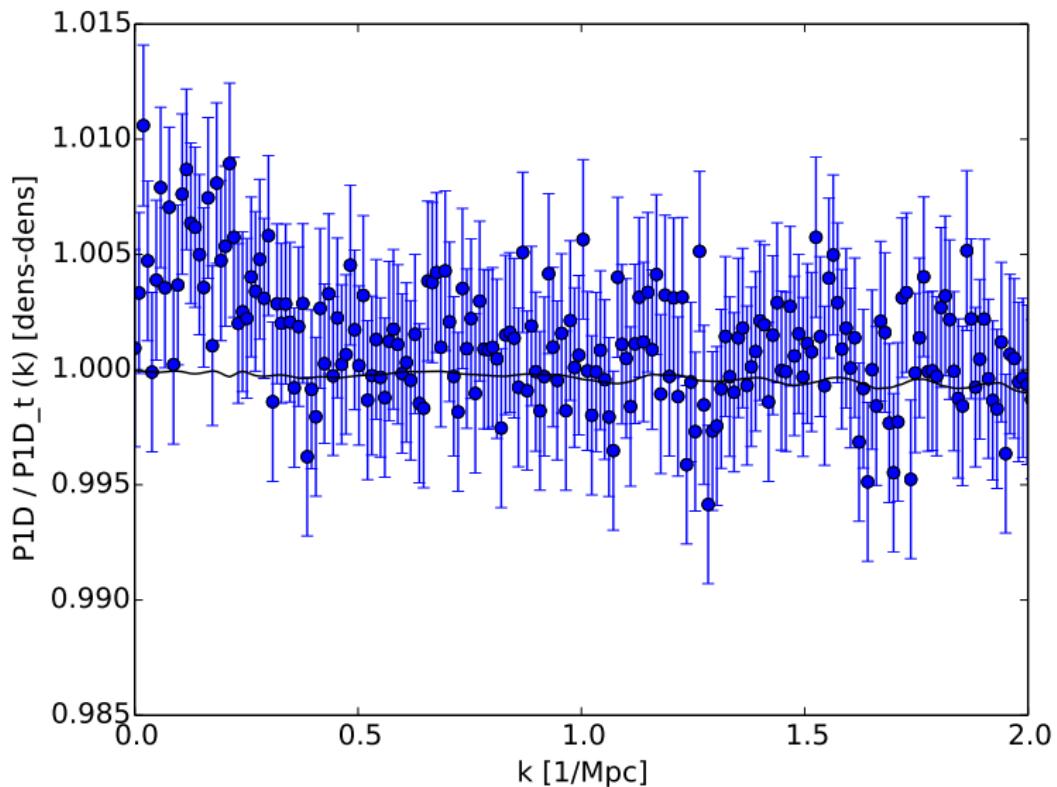
Split



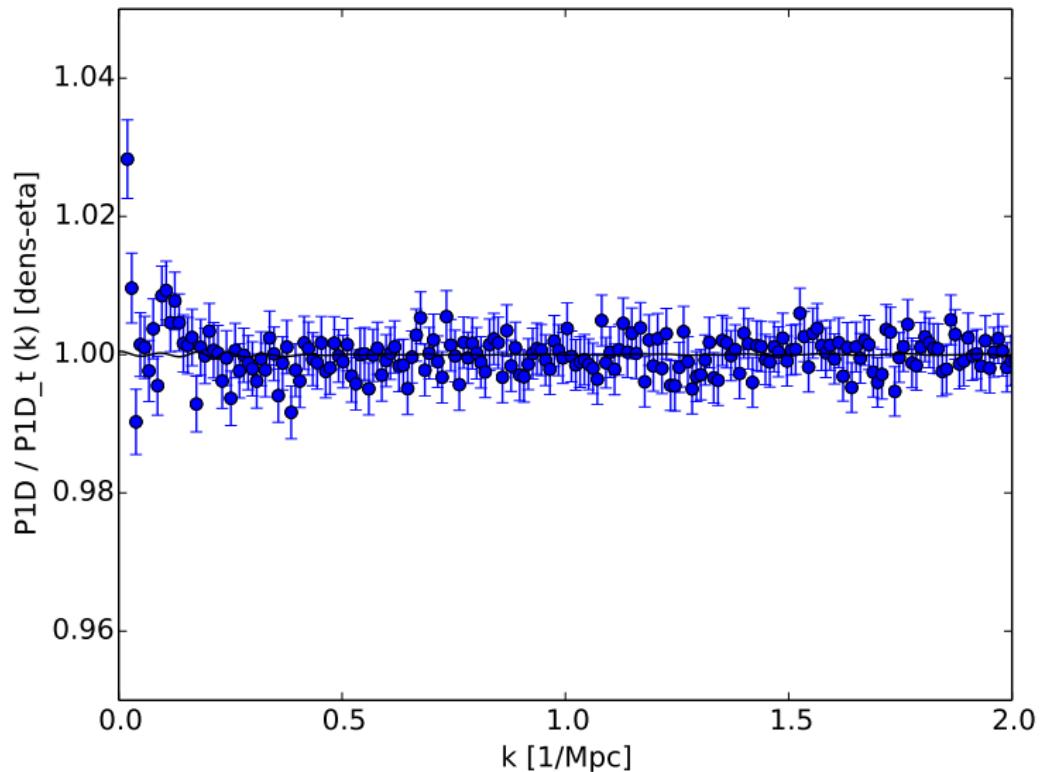
Test: use P1D

- ▶ To test these codes you need to start somewhere, but you have no code to rely on. So, used 1D power spectrum as a simplest test.
- ▶ Unlikely to get 1D spectrum right, but everything else wrong
- ▶ Simple noiseless tests: FFT, square, average
- ▶ very fast, very easy

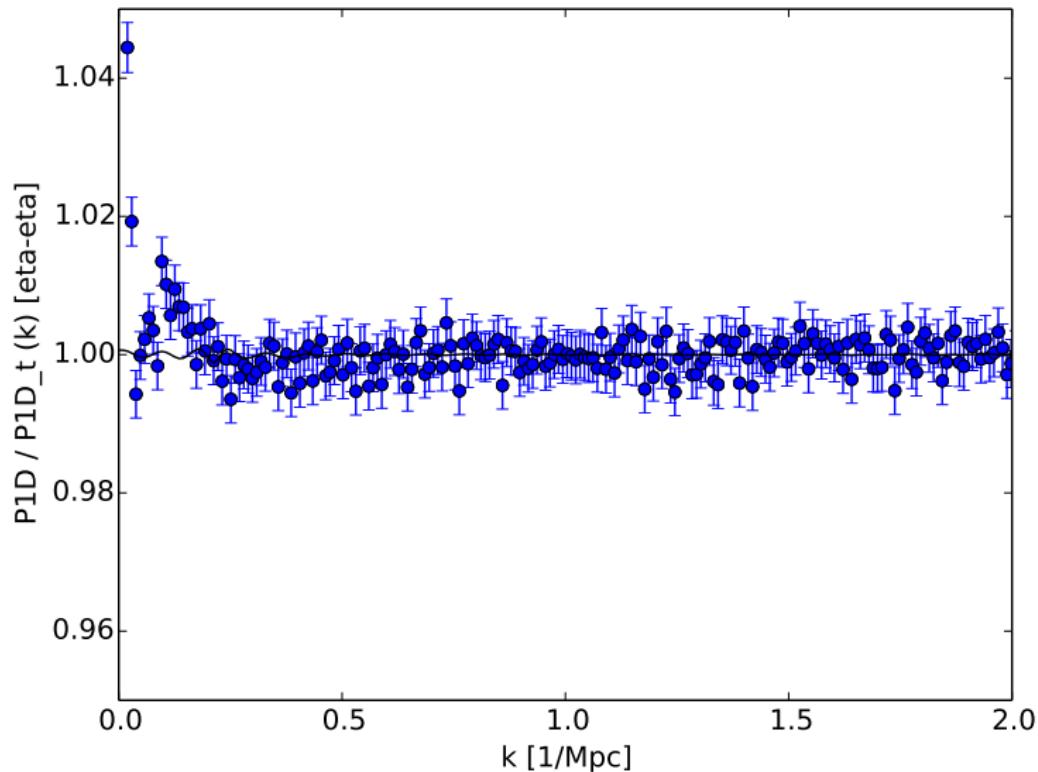
P1D:



P1D:

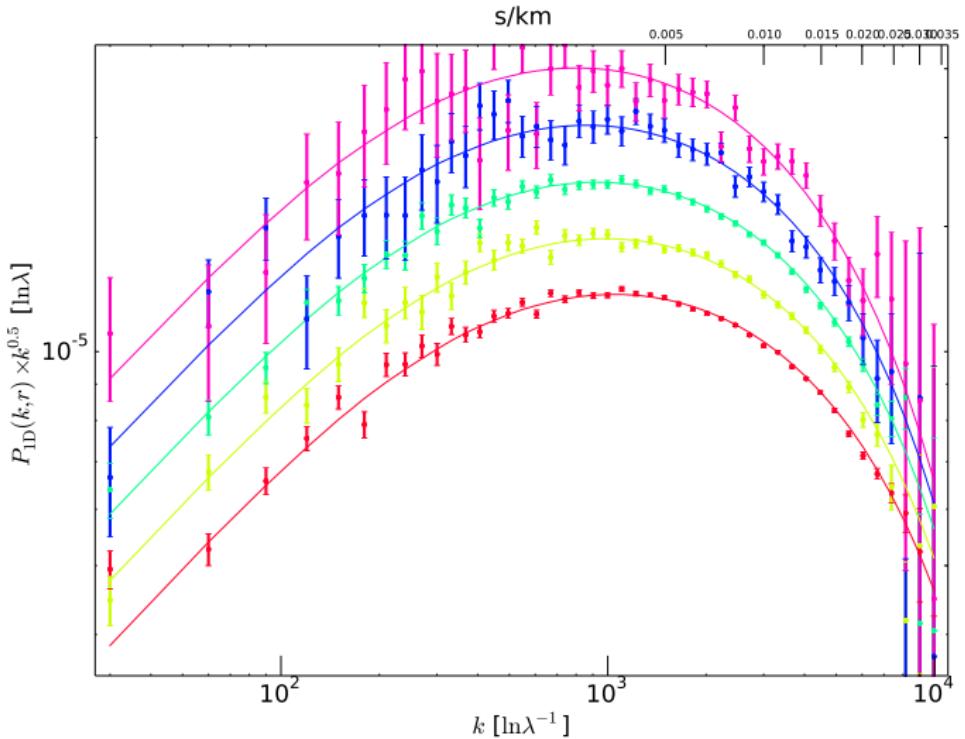


P1D:

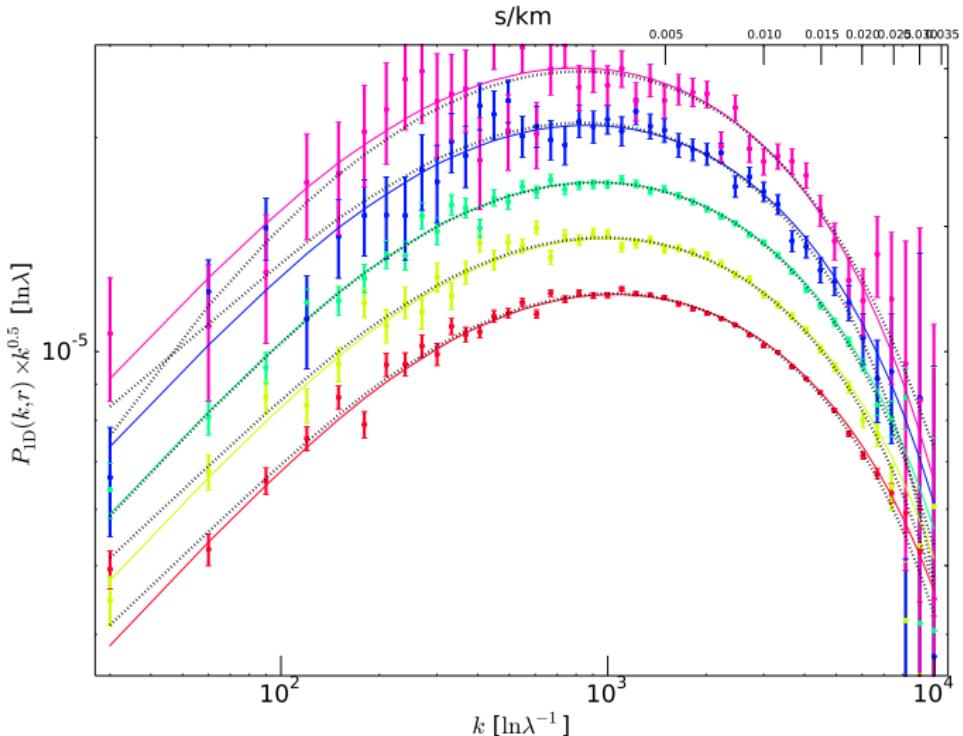


Test: use P1D

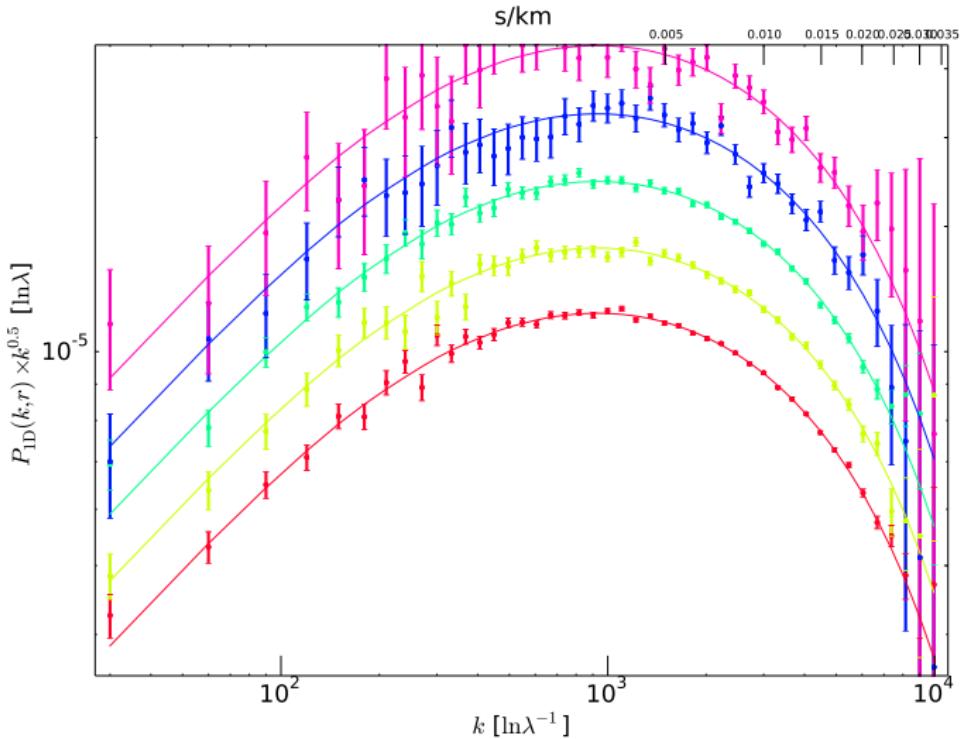
- ▶ Realistic P1D tests
- ▶ Mock the full quasars: continuum, noise, everything
- ▶ Push through the full estimation machinery [optimal quadratic estimator in fourier space: very fast, very complicated]
- ▶ Still limit to Gaussian forest (initially)



- ▶ Looks good, but poor χ^2 : 379 with 205 d.o.f.



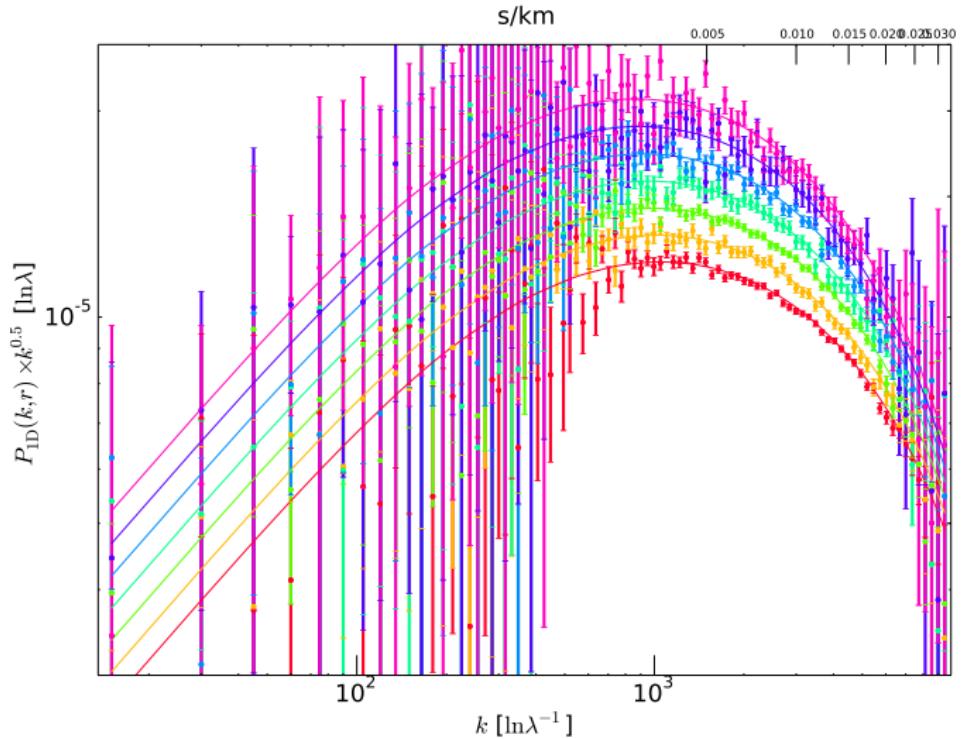
- ▶ Can improve χ^2 with a smooth few parameter model.



- ▶ Fourier mock maker has a good χ^2 : 206 with 205 d.o.f.

What is going on?

- ▶ Parameterized small errors, but no cigar: χ^2 dropped to 354 with 205 d.o.f.
- ▶ Tried another run with finer bins



Now we are talking

- ▶ With finer bins, χ^2 gets
- ▶ $\text{chi2} = 624.927993451$ with $\text{dof} = 574$ $p = 0.0693909627922$
- ▶ Add correction:
 $\text{chi2} = 599.958194356$ with $\text{dof} = 574$ $p = 0.219322648643$
- ▶ Size of correction is 0.08% to 0.6% – these measurements are just very precise.
- ▶ A small victory!

